

1 Version with Markings to Show Changes Made:

2
3 In the claims:

4
5 38 (Original) A power combiner having:

6 a central axis about which is disposed a plurality k of
7 cylindrical feed waveguides, each said feed waveguide having
8 a radius, an input port and a launching port, all centered
9 on a feed waveguide axis, said launching port including a
10 cylindrical helix;

11 a plurality k of focusing reflectors, one for each said
12 feed waveguide, each said focusing reflector centered on
13 said feed waveguide axis;

14 a final waveguide coaxial to said central axis and
15 collecting power reflected by each said focusing reflector
16 with a proximal final waveguide reflector port.

17
18 39 (Original) The power combiner of claim 38 where

19 $(1/n) \arccos(p/X_{pq})$ is an integer, when

20 said p = azimuthal wave number

21 said q = radial wave number

22 said X_{pq} = the eigenvalue of the mode.

23
24 40 (Amended) The power combiner of claim 38 where said
25 feed ~~guide~~ waveguide launch port helical section is formed
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1 by sweeping a line of length $L_{\text{feedlaunch}} = \theta * L_{\text{launch}} / 2 * \pi$ at said
2 radius from and parallel to said feed ~~guide~~ waveguide axis,
3 where θ is the angle in radians about said feed waveguide
4 axis and said L_{launch} is the length of the helical cut.

5

6 41 (Original) The power combiner of claim 38 where said
7 final waveguide is a cylinder.

8

9 42 (Original) The power combiner of claim 38 where said
10 feed waveguide axis is parallel to said central axis.

11

12 43 (Original) The power combiner of claim 38 where each
13 said feed waveguide radius is equal to each other said feed
14 waveguide radius.

15

16 44 (Original) The power combiner of claim 38 where at
17 least one said feed waveguide radius is different from any
18 other said feed waveguide radius.

19

20 45 (Amended) The power combiner of claim 38 where each
21 said feed waveguide helical section angle $\theta = 0$ is uniformly
22 offset with respect to a plane from said central axis to
23 said feed ~~guide~~ waveguide center axis.

24

1 46 (Amended) The power combiner of claim 38 where each
2 said feed waveguide helical section angle $\theta = 0$ is not
3 uniformly offset with respect to a plane from said central
4 axis to said feed ~~guide~~ waveguide center axis.

5
6 47 (Amended) The power combiner of claim 38 where said
7 feed ~~guide~~ waveguide helical launch port has a helical cut
8 depth

9
$$L_{\text{feedlaunch}} = 2\pi \{ k_{\text{par}} \sqrt{1 - (m/X_{mn})^2} \} / \{ k_{\text{perp}} \cos^{-1}(m/X_{mn}) \}$$

10 where

11 k_{par} is the parallel, or axial wave number

12 m is the azimuthal index of the mode in said feed ~~guide~~
13 waveguide

14 n is the radial index of the mode in said feed ~~guide~~
15 waveguide

16 X_{mn} is the eigenvalue of the mode

17 K_{perp} is the perpendicular wave number.

18
19 48 (Cancelled)

20
21 49 (Original) The power combiner of claim 38 where said
22 reflector is formed by a curve extruded along said central
23 axis, said reflector curve comprising a locus of points.

1 50 (Amended) The power combiner of claim ~~38~~ 49 where
2 said locus of points satisfies the following criteria for
3 each given locus point:

4 where each said feed waveguide has a circular feed
5 caustic and a feed caustic phase front, and said final ~~guide~~
6 waveguide has a circular final caustic and a final caustic
7 phase front, for each point on said locus, a first line
8 segment starting from said locus point, touching said feed
9 caustic and ending on said feed caustic phase front, and a
10 second line segment starting on said locus point, touching
11 said final caustic and ending on said final caustic phase
12 front:

13
14 a) the path length of said first line segment added to
15 said second line segment is a constant,

16 b) at each said locus point, an intersection point is
17 defined by the intersection of said locus point and a line
18 which is tangent to said reflector curve at said locus
19 point, and a perpendicular line which is perpendicular to
20 said tangent line at said locus point, said perpendicular
21 line bisecting the angle formed by said first line segment
22 and said second line segment.

23
24 51 (Original) The power combiner of claim 38 where each
25 said ~~plurality comprises k feed waveguides and k reflectors,~~
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1 ~~and the~~ has an angular extent ~~of each said reflector~~ about
2 said central axis ~~is~~ of 360/k degrees.

3

4 52 (Original) The power combiner of claim 38 where each
5 said input waveguide is coupled to a source of asymmetric
6 traveling wave power, said input power traveling through
7 each feed waveguide, reflecting from said reflector and
8 collected in said final waveguide.

9

10 53 (New) The power combiner of claim 38 where each said
11 feed waveguide, each said reflector, and said final
12 waveguide are electrically conductive.

13

14 54 (New) The power combiner of claim 38 where each said
15 feed waveguide, each said reflector, and said final
16 waveguide include an electrically conductive surface.

17

18 55 (New) A power combiner comprising:

19 a plurality k of feed waveguide cylinders, each said
20 feed waveguide cylinder having a feed waveguide axis and a
21 radius, and also having a launch end which includes a
22 helical cut ramp;

23 a cylindrical final waveguide;

24 a plurality said k of reflectors interposed between
25 said feed waveguide launch end and said final waveguide,

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1 each reflector for directing wave energy from said feed
2 waveguide cylinder to said final waveguide;

3 where k is an integer greater than 1.

4
5 56 (New) The power combiner of claim 55 where

6 $(1/n) \arccos(p/X_{pq})$ is an integer, when

7 said p = azimuthal wave number

8 said q = radial wave number

9 said X_{pq} = the eigenvalue of the mode.

10
11 57 (New) The power combiner of claim 55 where said feed
12 waveguide launch port helical section is formed by sweeping
13 a line of length $L_{\text{feedlaunch}} = \theta * L_{\text{launch}} / 2\pi$ at said radius from
14 and parallel to said feed waveguide axis, where θ is the
15 angle in radians about said feed waveguide axis and said
16 L_{launch} is the length of the helical cut.

17
18 58 (New) The power combiner of claim 55 where said feed
19 waveguide axis is parallel to said central axis.

20
21 59 (New) The power combiner of claim 55 where any said
22 feed waveguide radius is equal to any other said feed
23 waveguide radius.

1 60 (New) The power combiner of claim 55 where at least
2 one said feed waveguide radius is different from any other
3 said feed waveguide radius.

4
5 61 (New) The power combiner of claim 55 where each said
6 feed waveguide helical section angle $\theta = 0$ is uniformly
7 offset with respect to a plane from said central axis to
8 said feed waveguide center axis.

9
10 62 (New) The power combiner of claim 55 where each said
11 feed waveguide helical section angle $\theta = 0$ is not uniformly
12 offset with respect to a plane from said central axis to
13 said feed waveguide center axis.

14
15 63 (New) The power combiner of claim 55 where said feed
16 waveguide helical launch port has a helical cut depth

17
$$L_{\text{feedlaunch}} = 2\pi \{ k_{\text{par}} \sqrt{1 - (m/X_{mn})^2} \} / \{ k_{\text{perp}} \cos^{-1}(m/X_{mn}) \}$$

18 where

19 k_{par} is the parallel, or axial wave number

20 m is the azimuthal index of the mode in said feed
21 waveguide

22 n is the radial index of the mode in said feed
23 waveguide

24 X_{mn} is the eigenvalue of the mode

25 K_{perp} is the perpendicular wave number.

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3 64 (New) The power combiner of claim 55 where said
4 reflector is formed by a curve extruded along said central
5 axis, said reflector curve comprising a locus of points.

6

7 65 (New) The power combiner of claim 64 where said
8 locus of points satisfies the following criteria for each
9 given locus point:

10 where each said feed waveguide has a circular feed
11 caustic and a feed caustic phase front, and said final
12 waveguide has a circular final caustic and a final caustic
13 phase front, for each point on said locus, a first line
14 segment starting from said locus point, touching said feed
15 caustic and ending on said feed caustic phase front, and a
16 second line segment starting on said locus point, touching
17 said final caustic and ending on said final caustic phase
18 front:

19

20 a) the path length of said first line segment added to
21 said second line segment is a constant,

22 b) at each said locus point, an intersection point is
23 defined by the intersection of said locus point and a line
24 which is tangent to said reflector curve at said locus
25 point, and a perpendicular line which is perpendicular to

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1 said tangent line at said locus point, said perpendicular
2 line bisecting the angle formed by said first line segment
3 and said second line segment.

4
5 66 (New) The power combiner of claim 55 where said
6 plurality comprises k feed waveguides and k reflectors, and
7 the angular extent of each said reflector about said central
8 axis is $360/k$ degrees.

9
10 67 (New) The power combiner of claim 55 where each said
11 input waveguide is coupled to a source of asymmetric
12 traveling wave power, said input power traveling through
13 each feed waveguide, reflecting from said reflector and
14 collected in said final waveguide.

15
16
17 68 (New) The power combiner of claim 55 where each said
18 feed waveguide, each said reflector, and said final
19 waveguide are electrically conductive.

20
21 69 (New) The power combiner of claim 55 where each said
22 feed waveguide, each said reflector, and said reflector
23 waveguide include an electrically conductive surface.

1

2 70 (New Claim) A power combiner comprising:

3 k feed waveguides, each said feed waveguide formed from
4 a 4 sided polygon conductor comprising a rectangle having a
5 width and height adjoining a triangle having same said
6 height, said polygon then rolled into a cylinder with an
7 axis substantially parallel to said rectangle width thereby
8 forming said feed waveguide, said feed waveguide having a
9 launch end adjacent to said triangle;

10 a cylindrical final waveguide;

11 a plurality said k of reflectors positioned between
12 said k feed waveguides and said final waveguide input end;
13 where k is greater than 1.

14

15 71 (New) The power combiner of claim 70 where

16 $(1/\pi) \arccos(p/X_{pq})$ is an integer, when

17 said p = azimuthal wave number

18 said q = radial wave number

19 said X_{pq} = the eigenvalue of the mode.

20

21 72 (New) The power combiner of claim 70 where said feed
22 waveguide launch port helical section is formed by sweeping
23 a line of length $L_{\text{feedlaunch}} = \theta * L_{\text{launch}} / 2 * \pi$ at said radius from
24 and parallel to said feed waveguide axis, where θ is the

1 angle in radians about said feed waveguide axis and said
2 L_{launch} is the length of the helical cut.

3

4 73 (New) The power combiner of claim 70 where said feed
5 waveguide axis is parallel to said central axis.

6

7 74 (New) The power combiner of claim 70 where each said
8 feed waveguide radius is equal to each other said feed
9 waveguide radius.

10

11 75 (New) The power combiner of claim 70 where at least
12 one said feed waveguide radius is different from any other
13 said feed waveguide radius.

14

15 76 (New) The power combiner of claim 70 where each said
16 feed waveguide helical section angle $\theta = 0$ is uniformly
17 offset with respect to a plane from said central axis to
18 said feed waveguide center axis.

19

20 77 (New) The power combiner of claim 70 where each said
21 feed waveguide helical section angle $\theta = 0$ is not uniformly
22 offset with respect to a plane from said central axis to
23 said feed waveguide center axis.

24

1 78 (New) The power combiner of claim 70 where said feed
2 waveguide helical launch port has a helical cut depth

3
$$L_{\text{feedlaunch}} = 2\pi \{ k_{\text{par}} \sqrt{1 - (m/X_{mn})^2} \} / \{ k_{\text{perp}} \cos^{-1}(m/X_{mn}) \}$$

4 where

5 k_{par} is the parallel, or axial wave number

6 m is the azimuthal index of the mode in said feed
7 waveguide

8 n is the radial index of the mode in said feed
9 waveguide

10 X_{mn} is the eigenvalue of the mode

11 K_{perp} is the perpendicular wave number.

12

13 79 (New) The power combiner of claim 70 where said
14 reflector is formed by a curve extruded along said central
15 axis, said reflector curve comprising a locus of points.

16

17 80 (New) The power combiner of claim 79 where said
18 locus of points satisfies the following criteria for each
19 given locus point:

20 where each said feed waveguide has a circular feed
21 caustic and a feed caustic phase front, and said final
22 waveguide has a circular final caustic and a final caustic
23 phase front, for each point on said locus, a first line
24 segment starting from said locus point, touching said feed
25 caustic and ending on said feed caustic phase front, and a
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1 second line segment starting on said locus point, touching
2 said final caustic and ending on said final caustic phase
3 front:
4

5 a) the path length of said first line segment added to
6 said second line segment is a constant,

7 b) at each said locus point, an intersection point is
8 defined by the intersection of said locus point and a line
9 which is tangent to said reflector curve at said locus
10 point, and a perpendicular line which is perpendicular to
11 said tangent line at said locus point, said perpendicular
12 line bisecting the angle formed by said first line segment
13 and said second line segment.
14

15 81 (New) The power combiner of claim 70 where said
16 plurality comprises k feed waveguides and k reflectors, and
17 the angular extent of each said reflector about said central
18 axis is $360/k$ degrees.
19

20 82 (New) The power combiner of claim 70 where each said
21 input waveguide is coupled to a source of asymmetric
22 traveling wave power, said input power traveling through
23 each feed waveguide, reflecting from said reflector and
24 collected in said final waveguide.
25

1

2 83 (New) The power combiner of claim 70 where each said
3 feed waveguide, each said reflector, and said final
4 waveguide are electrically conductive.

5

6 84 (New) The power combiner of claim 70 where each said
7 feed waveguide, each said reflector, and said reflector
8 waveguide include an electrically conductive surface.

9